Ruisdael catalogue of services

This document is prepared in the context of the Ruisdael Observatory. Ruisdael Observatory is a Dutch nationwide atmospheric research facility for measurements and modelling of the atmosphere, set up to enable more concrete and detailed forecasts of weather and air quality.

The following observational platforms and facilities are part of the Ruisdael Observatory.

Fixed stations for long-term observations that deliver long-term data based on a regular measurement schedule and common operation standards:

Mobile facilities:

This document compiles the initial list of services within Ruisdael Observatory. The list is not exhaustive because current the stations are defining, refining, and implementing services in an ongoing development process that is fostered and supported by the Ruisdael Observatory. The list will be updated on a regular basis and finally result in a detailed catalogue of services provided by the Ruisdael Observatory.

Descriptions of services provided by the facilities in Ruisdael Observatory are presented in the next section.

Services provided by Cabauw

SERVICE 1 – In-situ, column integrated, vertical profiling and spatial atmospheric observations	
TYPE OF SERVICE	Data, research, technical, innovation, training service
SERVICE DESCRIPTION	The CESAR location in Cabauw is characterised by a 213 m high observation tower and surrounding observation field, located 50 km far from the North Sea. The site is ideal for atmospheric research on relations between the atmospheric boundary layer, land surface, weather, climate and atmospheric composition. The site is representative for long-term atmospheric studies because surroundings do not differ significantly from those in 1972 when the site was commissioned. Cabauw is one of very few observatories around the world that monitors such a wide scope of relevant processes in atmospheric chemistry and physics, hydrology, meteorology, climate, and atmospheric chemistry. The observational programme includes the following topics: - Operational meteorological station - Operational air quality monitoring station - In-situ observations of meteorological parameters, including extensive land-atmosphere interaction. - Energy balance observations including flux measurements. - Radiation observations, including a Baseline Surface Radiation Network (BSRN) installation and hemispherical cloud cover observations. - A suite of aerosol remote sensing instruments, including a high performance multi-wavelength Raman lidar for aerosols, clouds and water vapour, a ceilometer and a UV-depolarisation lidar. - A suite of (scanning) cloud remote sensing instruments, including 3/35/94 GHz cloud radars, microwave radiometers - Precipitation observations including a scanning drizzle radar, micro rain radar and disdrometers. - Wind profile observations along the tower up to 200 m and a scanning Doppler wind lidar - Greenhouse gas observations at four different levels in the tower between 20 m and 180 m. - In-situ aerosol observations, including scattering and absorbing aerosol properties, as well as chemical speciation and isotope analysis. - Atmospheric composition measurements using in-situ observations and UV-VIS remote sensing. In addition, the specific flight-restricted area over the station offers the possibility for drones, and tethered balloon flights. The Cabauw site offers access for research projects, measurement campaigns, intercomparisons, and test facility for new instruments, as well as training.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical, remote

TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Arnoud Apituley (Arnoud.apituley@knmi.nl)
SERVICE 2 – Cloud radar calibration	
TYPE OF SERVICE	The Cabauw site offers expertise, service and training for cloud radar calibration as part of the ACTRIS topical centre for cloud remote sensing (CCRES).
SERVICE DESCRIPTION	More information at: https://ruisdael-observatory.nl/cabauw/
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Prof.dr.ir. H.W.J. Russchenberg (h.w.j.russchenberg@tudelft.nl) and Christine Unal (C.M.H.Unal@tudelft.nl)
SERVICE 3 – Trace gas remote sensing intercomparison	
TYPE OF SERVICE	The Cabauw site offers expertise, service and training for UV-VIS trace gas remote sensing intercomparisons as part of the ACTRIS topical centre for trace gas remote sensing (CREGARS).
SERVICE DESCRIPTION	More information at: https://ruisdael-observatory.nl/cabauw/
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical
TARGET USERS	Academica, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	none
CONTACT	Arnoud Apituley (arnoud.apituley@knmi.nl)

Services provided by Lutjewad

In-situ, vertical profiling and spatial atmospheric observations of trace gases and aerosols	
TYPE OF SERVICE	Data, research, technical, innovation, training service
SERVICE DESCRIPTION	The atmospheric measurement station Lutjewad was established in the year 2000 by the Centre for Isotope Research (CIO) University of Groningen. It hosts a 60 m high sampling mast. The station is located 30 km northeast from the city of Groningen (220,000 inhabitants) on the northern coast of the Netherlands (6.3529º E, 53.4037º N, 1 m asl) situated directly behind the Wadden Sea dike. On the seaside, sporadically flooded salt marshes next to the dike pass into the Wadden Sea with its tidal flats. It stretches about six kilometers to the north where the island Schiermonnikoog marks the transition to the North Sea. The rural landscape to the south consists mainly of pasture and cropland with patches of forested land. The livestock in the area is dominated by dairy cows and sheep. The coastal location of the station allows relatively clean marine background air to reach the sampling tower in contrast to more polluted air masses coming with the prevalent south-east to south-westerly winds. Based on wind direction data we find that the station receives 16% of the time northerly winds (315 - 45 degrees sector), 34% southerlies (135 - 225 degrees sector), 22% easterlies, and 28% westerlies. The observational programme includes the following activities: - Operational ICOS Class-2 greenhouse gas monitoring station (CO_2, CH_4, N_2O, CO, Radon, O_2/N_2-ratio, isotopes of CO_2) sampling from 60 m altitude. - In-situ observations of meteorological parameters at 7, 20, and 60 m. - In-situ aerosol observations, including scattering and absorbing aerosol properties, as well as chemical speciation and isotope analysis. - Cloud remote sensing instruments, including a polarimetric scanning Cloud Radar and a High-precision microwave radiometer for continuous atmospheric profiling of clouds (TU-Delft). - Parsivel Disdrometer for in-situ measurements of rain (raindrop size distribution) In addition, the specific flight-restricted area over the station offers the possibility for drones, and tethered balloon flights. The Lutjewad site offers access for research projects, measurement campaigns, intercomparisons, and test facility for new instruments, as well as training.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical, remote
TARGET USERS	Academia, public sector
SERVICE STATUS	The service is available on request

AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Bert Scheeren (h.a.scheeren@rug.nl) and Bert Kers (b.a.m.kers@rug.nl) for atmospheric trace gas observations; Uli Dusek (u.dusek@rug.nl) and Jan Mulder (jan.mulder@rug.nl) for aerosol observations; Herman Russchenberg (h.w.j.russchenberg@tudelft.nl) and Christine Unal (C.M.H.Unal@tudelft.nl) for cloud radar observations.

Services provided by Loobos

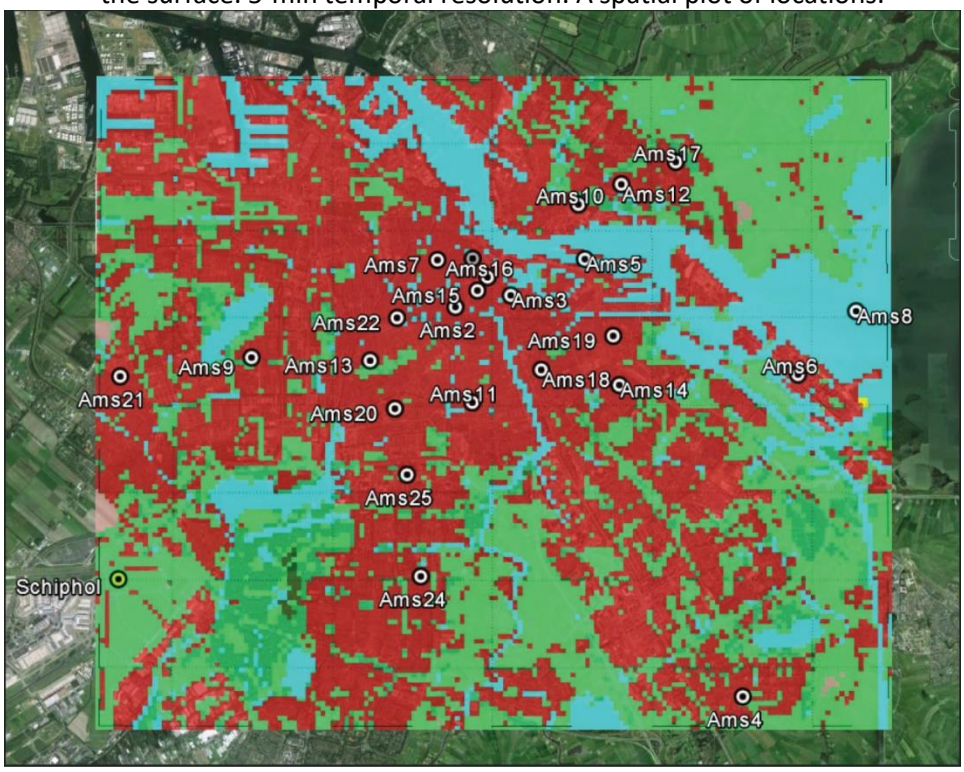
Loobos meteorological and ecosystem measurements	
TYPE OF SERVICE	Data, research infrastructure, experimental site
SERVICE DESCRIPTION	The Loobos ecosystem site is located in a typical Veluwe pine forest near Kootwijk. The forest was planted in the 1910's on bare sand. The trees are now around 22 m tall. At the site, a 36 m tall tower is build to support meteorological and ecological measurements. Below is the list of continuous measurements being performed and planned: - Radiation (shortwave, longwave, incoming and outgoing) - PAR (Photosynthetically Active Radiation, incoming, reflected) - Eddy covariance flux measurements of sensible heat, latent heat (evaporation), net CO2 flux - Wind speed and direction profile at 5 heights into the canopy - Temperature profile at 5 heights into the canopy - CO2 and H2O concentration profile at 11 heights into the canopy - Air pressure - Sap flow sensors - VOC concentrations - TDS temperature profile To be installed (before April 2023): - Soil temperature profiles (2x) - Soil moisture profiles (2x) - Soil heat flux (2x) - Precipitation (weighing gauge) In addition the site is available for experiments and non-continuous observations. In addition, a heritage data set is available from pre-Ruisdael from 1996-2021.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical and online
TARGET USERS	Academia, public, private
SERVICE STATUS	Available and being installed
AVAILABILITY PERIOD	Starting summer 2021, instruments are being added
TIME CONSTRAINTS	EC measurements 20 Hz, radiation meteo and profile measurements 2 s.
CONTACT	Michiel van der Molen (Michiel.vanderMolen@wur.nl)

Services provided by Veenkampen

SERVICE 1 – In-situ, atmospheric observations	
TYPE OF SERVICE	Data, research, technical, innovation, training service
SERVICE DESCRIPTION	The Veenkampen atmospheric observatory is situated outside the city Wageningen in a rural grassland area. Unique is the very open location with a very low horizon disturbance which is unique for such a central location within The Netherlands. It is located in the Veluwe valley, just 13.4 km SSW of the country's geographical center. The region is known for its intensive farming. The site is ideal for atmospheric research on relations between the atmospheric exchange processes of carbon and nitrogen. The first atmospheric measurements in Wageningen already started a century ago and the station had to move twice because of urban expansion. The current location started operation in 2010. The observational programme includes the following topics: - Operational meteorological station - Operational air quality monitoring station: Black carbon, NO, NO2, O3 - In-situ observations of meteorological parameters, including extensive land-atmosphere interaction. - Energy balance observations including flux measurements. - Radiation observations -The Veenkampen site offers access for research projects, measurement campaigns, intercomparisons, and test facility for new instruments, as well as education.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Web based archive, open access, near real time updated, including raw and processed eddy covariance measurements of turbulent heat exchange and CO2 fluxes.
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Bert Heusinkveld (Bert.heusinkveld@wur.nl)
SERVICE 2 – Radio soundings	
TYPE OF SERVICE	Mobile service for atmospheric profiling up to 5 km
SERVICE DESCRIPTION	Our weather balloons can be deployed quickly and almost anywhere. For example to study boundary layer development during the day.

ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	For short intensive field campaigns.
TIME CONSTRAINTS	days
CONTACT	Bert Heusinkveld (Bert.heusinkveld@wur.nl)

Services provided in Amsterdam

SERVICE 1 – In-situ spatial meteorological observations	
TYPE OF SERVICE	Data, research, technical, innovation
SERVICE DESCRIPTION	The Amsterdam Atmospheric Monitoring Supersite consists of a meteorological network of observations in Amsterdam (The Netherlands) and was established in 2014. It is one of the few urban observatories in Europe that monitors a variety of variables in urban atmospheric chemistry and physics, urban hydrology, meteorology, and urban climate. The main focus of the network is to monitor urban meteorology (urban heat island, heat stress, wind speed and turbulence, humidity) and surface radiation and energy balance components (sensible heat flux, latent heat flux). The Amsterdam Atmospheric Monitoring Supersite is one of the few urban observatories in Europe around the world that monitors such a wide scope of relevant processes in atmospheric chemistry and physics, hydrology, meteorology, climate, and atmospheric chemistry. The observational programme includes the following topics: • 24 operational meteorological stations at lampposts at 4 m height above the surface. 5-min temporal resolution. A spatial plot of locations:  • Energy balance observations including turbulent flux measurements (short- and longwave up- and downwelling radiation, sensible heat flux,

	latent heatflux, friction velocity) at the Munt square using the Eddy covariance technique. • Scintillometer observations of sensible and latent heat flux over a path between the Havengebouw and Student Hotel • webcam photo's from Havengebouw, looking SE, each 15 min • Precipitation and black globe thermometer at 15 locations • Indoor air temperatures at a selected number of citizen science based locations On campaign basis we offer • Wind profile observations using SODAR observations • Balloon soundings • Traverse observations of cargo tricycles recording temperature, humidity, wind speed, omnidirectional short- and longwave radiation, physiological equivalent temperature.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Gert-Jan Steeneveld (Gert-Jan.Steeneveld@wur.nl) Bert Heusinkveld (Bert.Heusinkveld@wur.nl)
SERVICE 2 – Greenhouse gas monitoring	
TYPE OF SERVICE	Data, research
SERVICE DESCRIPTION	The Amsterdam Atmospheric Monitoring Supersite offers observations for urban greenhouse gas exchange monitoring. Eddy-covariance based CO2 flux observations are available at the roof (40 m above ground level) of a hotel at the Muntsquare in Amsterdam since 2018. The footprint of the site roughly covers an area of 500 m around the tower. Methane flux observations were done between 2018-2021
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)

AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Gert-Jan Steeneveld (Gert-Jan.Steeneveld@wur.nl) Bert Heusinkveld (Bert.Heusinkveld@wur.nl)

Services provided in Rotterdam

SERVICE 1 – In-situ atmospheric observations of trace gases and aerosols	
TYPE OF SERVICE	Data, research, technical, innovation service
SERVICE DESCRIPTION	The greater Rotterdam area has a large anthropogenic influence on the (local) composition of the atmosphere. The combined, but spatially separated, presence of major source types makes Rotterdam an ideal test bed for innovative methods to characterize and quantify the different sources of anthropogenic emissions. Three urban background sites (West, North and South of Rotterdam/Rijnmond see Rotterdam – Ruisdael (ruisdael-observatory.nl) for locations) have been equipped with a mast of 10 meter height, a laboratory container and instruments to measure greenhouse gases and air pollutants (aerosols and NOx). Permanent or temporary placement of additional instruments is possible. Measurements started in 2014 at 2 stations but since 2020 a western location on the Maasvlakte has been added. The sites offer opportunities to study three distinctly different source areas and activities: the port with its industrial and shipping activities, the city area with intense traffic and domestic heating, and the horticulture area Westland. Additional air quality data is available from 13 basic air quality stations in the Rotterdam area (operated by RIVM-DCMR), mostly focusing on inner-city air quality (street stations). The Ruisdael observational programme includes the following activities: - Operational greenhouse gas monitoring station (CO_2, CH_4,) - Operational air quality monitoring station (NOx, CO, PM10 (2 stations), Black Carbon). - One station will be extended with an Aerosol Chemical Speciation Monitor (ACSM) to get a better handle on the composition, and sources of local pollution.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical, remote
TARGET USERS	Academia, public sector
SERVICE STATUS	The service is available on request
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Hugo Denier van der Gon (hugodeniervandergon@tno.nl) Marcel Moerman (Marcel.moerman@tno.nl)

SERVICE 2 – In-situ spatial atmospheric observations of urban meteorological parameters	
TYPE OF SERVICE	Data, research, technical, innovation service
SERVICE DESCRIPTION	The greater Rotterdam area has a large anthropogenic influence on the (local) composition of the atmosphere. The combined urban / industrial ecosystem is a test bed for innovative methods to characterize and quantify the impact of anthropogenic activities on urban meteorology. In The Netherlands, extreme rainfall has one of the highest return times in the Rotterdam area, due to its vicinity to the sea, prevalent wind flows and surface heterogeneity of the surroundings. High resolution rainfall measurements and forecasts are required to optimize water management in the city and its surroundings. Three urban background sites (West, North and South of Rotterdam/Rijnmond see Rotterdam – Ruisdael (ruisdael-observatory.nl) for locations) have been equipped with a mast of 10 meter height, a laboratory container and instruments to measure meteorological parameters (cloud radar, micro rain radar, disdrometer and weather stations). Permanent or temporary placement of additional instruments is possible. KNMI weather data are available from the nearby Rotterdam/The Hague airport. The observational programme includes the following activities: - Cloud remote sensing instruments, including a Cloud Doppler Radar and a High-precision microwave radiometers for continuous atmospheric profiling of cloud droplets (TU-Delft). - Precipitation sensors, including a network of 4 vertically profiling micro rain radars and 4 optical disdrometers for continuous measurement of raindrop size distributions, vertical variability of rain, melting layer detection, hydrometeor classification and real-time calibration of reflectivity factors for scanning radars. - Weather sensors, including temperature, wind, rain, pressure, humidity and solar radiation for continuous monitoring of atmospheric conditions and better understanding of local weather patterns and micro-climates.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical, remote
TARGET USERS	Academia, public sector
SERVICE STATUS	The service is available on request
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Herman Russchenberg (h.w.j.russchenberg@tudelft.nl) and Christine Unal (C.M.H.Unal@tudelft.nl) for cloud radar observations Marc Schleiss (M.A.Schleiss@tudelft.nl) for weather and precipitation measurements

Services mobile facilities

SERVICE 1 - Scintillometer network	
TYPE OF SERVICE	Data, research, technical, innovation, training service
SERVICE DESCRIPTION	The scintillometer technique, a horizonal line-of-sight remote sensing method, concerns light intensity fluctuation measurements caused by atmospheric turbulence. From these the structure parameter of the refractive index can be determined which is a measure for the optical turbulence intensity. This parameter, in turn, can be related to area averaged surface fluxes of sensible and latent heat (evapotranspiration). Within the Ruisdael network 4 scintillometer systems are available consisting of a RPG-MWSC-160 micro-wave scintillometer (MWS) by Radiometer Physics GmbH, Meckenheim, Germany and LAS MkII optical, large aperture scintillometer (LAS) by Kipp & Zonen, Delft, the Netherlands. The scintillometer systems are operated over pathlengths ranging between 800 m – 10 km. The 4 scintillometer locations are: 1. Cabauw long path: Transmitter at the Gerbrandy tower (IJsselstein) and receiver at Cabauw tower – path length ~9.8km – path height ~80m – in operation since May 2021 (system without MWS since 2001) 2. Cabauw short path: Transmitter at the Cabauw remote-sensing platform and receiver at Cabauw near Wielse kade exit – path length ~0.8km – path height ~10m – in operation since August 2020 (system without MWS since 2018) 3. Amsterdam: Transmitter at the Student Hotel and receiver at the Port of Amsterdam – path length ~3.2km – path height ~55m – in operation since August 2019 4. Loobos: installation pending Note that Cabauw long-path and Amsterdam are fixed sites that are in continuous operation. The systems at Cabauw short-path and Loobos are part of the mobile facilities and can be deployed elsewhere on a campaign basis. The observational program includes the following topics: - Continuous monitoring of area averaged surface fluxes over contrasting land uses (collaboration with KNMI, AAMS, Ruisdael campaigns) - Reference site for microwave communication link estimates of rainfall and evaporation (collaboration with Remko Uijlenhoet, TU-Delft) - Reference site for long path optical propagation measurements (collaboration with Kristiaan Broekens and Aleid Oosterwijk, TNO) - Reference site for optical turbulence measurement related to applications in astronomy and solar physics (collaboration with Rob Hammerschlag and others, University Utrecht and University of Leiden) PI is available to discuss any type of collaboration in the form of research projects, measurement campaigns, intercomparisons, as well as training.

ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical, remote
TARGET USERS	Academia, public sector
SERVICE STATUS	Operational systems are available. Use within campaigns upon request.
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	Operational systems are available. Use within campaigns upon request.
CONTACT	Oscar Hartogensis (oscar.hartogensis@wur.nl)

SERVICE 2 –Atmospheric measurements of GHGs on mobile platforms using Active AirCore	
TYPE OF SERVICE	Data, research
SERVICE DESCRIPTION	Active AirCores collect ambient air samples on a mobile platform, and are used to retrieve in situ continuous profiles of greenhouse gases and related tracers along the trajectory of mobile platforms, be it a van, a drone, or an aircraft. Multiple AirCores with various lengths (50 – 285 m) and volumes (350 -4350 mL) are available. The measurement time varies from tens of minutes on a drone to a few hours on a van or on an aircraft. In principle, AirCore air samples can be analyzed for any species that are stable when stored in the AirCore tubing. The current analyzed trace species include CO_2, CH_4, CO, N_2O, COS.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	In situ
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	None
CONTACT	Huilin Chen (Huilin.Chen@rug.nl)

SERVICE 3 – PH-WUR research aircraft	
TYPE OF SERVICE	Airborne in-situ observations of fluxes and scalars
SERVICE DESCRIPTION	Push propellor research aircraft, SkyArrow 650 TCNS, call sign PH-WUR, two seater (pilot + optional task specialist). The aircraft is operated under SPO and

	VFR regulations[1]. Operations 200-8000ft, duration 3 hrs, nominal airspeed of about 35 m/s. Equipped with a set of fast response turbulence instruments (3D wind and water vapor and carbon dioxide - Licor 7500) complemented with a set of scalar instruments (net radiation, incoming and reflected photosynthetic active radiation, air and surface temperature, precision concentrations of CO_2 and CH_4 (Licor 7810/15). An Inertial GPS system combined with accelerometers records position and attitude of the aircraft. Fast response instruments sampled at 50Hz. Data acquisition PC with double screen. The aircraft and its data processing are described in detail in {Vellinga, 2013 #11410}.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Other instrumentation possible is consultation, within payload dimensions and power requirement (5/12/24V 300 W) constraints. Port 200x200mm available for e.g. camera's, inlets, etc.
TARGET USERS	Researchers with interest in surface energy and trace gas exchange and / or planetary boundary layers: surface fluxes, flux divergence, entrainment fluxes, concentration profiles Academia, business/private sector, public sector
SERVICE STATUS	Operational, flexible pilot pool
AVAILABILITY PERIOD	Continuous, year round, aeronautical constraints permitting
TIME CONSTRAINTS	None
CONTACT	Ronald Hutjes (ronald.hutjes@wur.nl) +31317486462

SERVICE 4 – Transportable Cloud Profiler: observing clouds and precipitation at different locations	
TYPE OF SERVICE	Data, research, technical, innovation, training
SERVICE DESCRIPTION	Transportable for extending observation capability of cloud and precipitation. Can participate to dedicated campaigns at non-cloud profiling Ruisdael stations, international campaigns (ACTRIS) in the context of cloud radar intercalibration. The facility consists of a trailer and the following instruments: 94 GHz scanning polarimetric cloud radar (remote sensing) Microwave radiometer (remote sensing) Micro-rain radar (vertically profiling, remote sensing) Parsival Disdrometer (in-situ) Pyranometer (in-situ)

[1] VFR = visual flight rules, allowing only daylight flights with good visibility; SPO = specialised operations documenting and certifying all non-standard flight operations

	Weather station Default location: Delft University of Technology (Green Village)
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical, Remote
TARGET USERS	Academia, Public sector
SERVICE STATUS	The service is available on request
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	none
CONTACT	Christine Unal (c.m.h.unal@tudelft.nl)

SERVICE 5 – Instrumented Van	
TYPE OF SERVICE	Data, research, technical, innovation, training service
SERVICE DESCRIPTION	Doing measurements while driving around provides high spatial resolution (1 m) gas and particle concentration patterns. These patterns show changing background conditions moving over larger distances and on top of that gas and aerosol plumes that emerge from sources upwind of the position of the car. Typical experiments are source emission evaluation for landfills, oil and gas installations or farms. But also mobile emissions (ships, planes, cars) or leak detection in cities can be done with this set. The 6m TNO van is a platform on which multiple instruments can be used simultaneously to do ground level concentration mapping. The van has 16 amp 24 hour battery powered mains available. Apart from the driver & operator 3 (max 4) guests can join when driving and measuring. The van is flexible to add instruments, depending on the mission different instrument racks will be placed or swapped. Instruments that are not needed for the project commissioning the drive are in general moved out not to " decay instruments" in driving conditions that provide data that is not used anyway. Greenhouse & reactive gasses: On board either an Aerodyne TDLAS is available (CO2-CH4-N2O-CO-C2H6-H2O) or MIRO (CO2-CH4-N2O-CO-NH3-SO2-NO-NO2-O3 -H2O) instrument provides 2 Hz ambient air concentration data while driving. Aerosol data An AE33 BC instrument, LASX 1Hx size spectrometer, EPC particle counter, In house developed fast response soot sensor, FSPMS for 1Hz size distribution data. Auxiliary data:

	GPS, AIS and meteo instrumentation is standard on board as well. All data is streamed and made visible to the operator in the front of the car facilitating quick decision making for drive transects and on the fly documentation of events that are observed. In areas with network coverage remote access to the PC's on board is possible.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Data available on request at TNO campaign data for Ruisdael campaigns available on the share provided by the Ruisdael consortium.
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	All year round
TIME CONSTRAINTS	The operators for the van are active in many different projects so depending on the agenda of the driver/ operator team.
CONTACT	Arjan Hensen (arjan.hensen@tno.nl)

SERVICE 6 – Semi mobile trailer	
TYPE OF SERVICE	Data, research, technical, innovation, training service
SERVICE DESCRIPTION	6m Semi mobile lab designed for on-site ambient air measurements of aerosol physical and chemical properties. Can operate stand alone for a limited time but needs mains connection 220V @ 16 amps depending on the active instrumentation. The trailer is the main home for the ACSM that measures aerosol chemical composition, SMPC, CPN and other aerosol instrumentation can be added as well as NO-NO2 monitor sets. The Trailer has several inlet ports to facilitate extra equipment for example filter collection instrumentation. The design has a lift to raise a Chimel- Bruker FTIR solar tracking combination to the roof of the trailer for full column measurements.
ATMOSPHERE TYPE	Ambient
TYPE OF ACCESS	Physical
TARGET USERS	Academia, business/private sector, public sector
SERVICE STATUS	The service is available (operational and ready to be offered)
AVAILABILITY PERIOD	For field campaigns
TIME CONSTRAINTS	Weeks
CONTACT	Arjan Hensen (arjan.hensen@tno.nl)